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MACA PRODUCTS AND THEIR USES

CROSS REFERENCE TO A RELATED APPLICATION

This application claims benefit of United States Provisional Application No.: 60/152,468, filed September 3, 1999, in the name of Paul Bobrowski and others.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to maca products and their uses. Maca is a root vegetable grown in South America for human and animal consumption. More particularly, the invention relates to new maca food products and to methods of marketing and making such new products.

2. Description of Related Art Including Information Disclosed under 37 CFR 1.97 and 37 CFR 1.98

"Maca" is the common name of a cruciferous South American root vegetable found high in the rather barren Andean plateaus of the Puna region of Peru. The common Latin name of maca is *Lepidum meyenni,* although it has been suggested that the plant should be called *Lepidum peruvianum.* Maca has been cultivated for thousands of years and is a staple in the diet of today's indigenous Andeans who also use it extensively as an animal feedstuff. However, maca is not employed in old world agriculture as are other South American crops such as potatoes *(Solanum tuberosum),* tomatoes *(Lycopersicum esculentum)* and maize *(Zea mais).* Maca is not related to these common crops, but is believed to be the only true crucifer native to South America. It is a member of the *Brassica* family which includes broccoli and brussel sprouts.

The tuberous roots can be dried in the sun and stored for periods of up to several years, while retaining nutrients. Maca is consumed fresh or dried. The tubers can be roasted and eaten directly, like potatoes. They have a unique tangy taste and an aroma that has been likened to butterscotch. The dried tubers can be hydrated overnight and parboiled in milk or water until soft to make a sweet aromatic porridge. The rehydrated tubers can be comminuted and mixed with fruit juice and milk to prepare juices and cocktails. Maca jams and puddings are also popular in some areas. The leaves, raw or cooked have a hot cress-like flavor and can be used as greens in summer salads. They are also a choice feed for fattening domesticated animals, for example sheep, for the table.

Maca has been used for centuries to enhance fertility in humans and animals and in particular to combat altitude-related sterility. It has been believed to improve both physical and mental capacities and has been used in Peruvian herbal medicine to

treat a variety of conditions including anemia, tuberculosis, menstrual disorders, menopause symptoms, as well as sterility and other reproductive or sexual disorders as well as to enhance memory.

Nutritionally, maca's composition resembles the beneficial qualities of cereal grains such as maize, rice and wheat, yet has the desirable size and easily harvested properties of a root vegetable, and is easily stored. Typically, maca has five times more protein, four times more fiber and less fat than potatoes. It has a favorable ratio of unsaturated fat to saturated fat.

Additionally, maca is rich in important minerals such as potassium, iron, calcium, manganese, copper and zinc. For all these reasons, it is a nutritionally highly desirable vegetable. Furthermore, maca contains five natural sterols, making it a popular supplement for athletes and body builders, as well as isothiocyanates and glucosinolates which, by analogy with other cruciferous vegetables, may provide a protective effect against cancer. Accordingly, maca is a highly desirable vegetable providing benefits that could be widely utilized.

At the time of this invention, maca is an important factor in the economy of the Puna region of Peru, providing local sustenance, animal feed and income from sale of maca products outside the Puna region. One such exported product is a fine powder prepared from dried maca roots which is available in Peruvian cities and to affluent consumers in the industrialized world. The powder is typically marketed in 500 mg or 1000 mg capsules, or as a supplement to be added to drinks. However, the demand for maca products outside the Puna region is limited.

Capsules and powdered maca have a number of drawback as sources of maca. Many people have difficulty with, or dislike capsules which are not consumed as ordinary foods but are taken as an adjunct to meals, like medicine. Maca powder is

a somewhat concentrated form of maca, by virtue of the drying step or steps required to make the powder, which has a pronounced flavor that is unattractive and too strong for many people. For others, the maca flavor is an acquired taste. Like other acquired tastes, the flavor may not be immediately appealing, but it can improve with experience.

Accordingly, conventional maca powder products recommend adding the powder to drinks. Naturally, maca imparts its own flavor to drinks and adds a textural perception neither of which may be appealing. Also, the flavor may still be too strong if adequate amounts of maca for nutritional purposes are used, and there are few drinks that effectively complement the maca flavor.

It would be desirable to market maca and provide maca products that enable affluent consumers in the industrialized world readily to consume beneficial quantities of maca. It would also be helpful to the economy of the Puna region of Peru, and to comparable regions elsewhere that might benefit by cultivating maca, if demand for maca in the United States and other industrialized countries could be increased.

BRIEF SUMMARY OF THE INVENTION

The present invention solves the problems of increasing the demand for maca and of providing maca in an appealing form, whereby beneficial quantities can readily be consumed, by providing, in one aspect, shaped solid food products incorporating an effective amount of maca, the source for the maca comprising dry powdered maca root.

Preferably, the food product is a cooked food product, for example bread, chips or pet treats, but it may be a product which is intended to be cooked before being consumed, for example pasta, gnocchi or tortilla. A number of preferred

embodiments of the invention include one or more grain flours, for example wheat, rye, spelt and so on, in the food product. Some preferred embodiments also include one or more herbs or spices, or a mixture of herbs and spices, selected to complement, enhance, or mask the maca flavor. A wide range of other food ingredients may be included, for example, eggs, oils, fats, sugar, nuts, salt, molasses and flavorings to provide a variety of different maca-containing food products for example bagels, pizza crusts, muffins, crunches and so on.

One preferred ingredient is egg white which is helpful in integrating maca into cooked food products, for example pastas and breads. In breads, a combination of maca and egg white can improve the elasticity of breads which is helpful in providing a light bread, or bread-like product, for example muffins or cakes.

Surprisingly, shaped food products can be provided which contain nutritionally effective quantities of maca yet which have structural integrity and good consistency when dried or cooked and are palatable, or indeed flavorful. Though maca powder is a preferred form of maca for incorporation in foodstuffs, pursuant to the invention, and maca powder has flour-like consistency, cooking tests of maca powder mixed with water suggest maca lacks the desirable cooking characteristics of wheat flour.

The invention includes dry powdered maca packaged in bulk for sale to consumers, preferably in containers each of which has a hermetic, tamper-resistant seal and which can be used to store the maca supply between uses. Preferably the maca container is provided with a quantitative dispensing device, for example a measuring scoop. Preferably also, the container is accompanied by one or more recipes for shaped, cooked maca products, or with one or more sources for such information, or with recipes and a source for additional information, for example a web site.

The dry powdered maca product may be substantially pure maca or a composition of maca and one or more grain flours, the composition comprising for example from 10 to 90 percent maca by weight. Other dry recipe ingredients can be added to the maca powder or maca mixture. The maca powder is partially cooked in the drying process. By instructing the consumer to prepare cooked products from drying powdered maca, the palatability of the end product to many consumers can be assured. Thus the invention also provides a two-stage process of providing maca-containing foods whereby maca plant materials are dried, with partial cooking, and preferably are reduced to a powder, then subsequently mixed with other food ingredients and cooked further to provide a cooked maca-enriched food product.

The invention also contemplates methods of making maca-containing food products and methods of marketing maca, wherein consumers are provided with a bulk source of powdered maca and are directed to consume effective quantities of maca in appealing and palatable forms to provide nutritional benefits attributable to maca consumption.

BRIEF DESCRIPTION OF THE DRAWING FIGURE

One or more embodiments of the invention and of making and using the invention, as well as the best mode contemplated of carrying out the invention, are described in detail below, with reference to the examples, and the single exemplary figure of the accompanying drawings which illustrates one suitable packaging form for a marketing a powdered maca product, according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

One problem with the way in which maca is marketed to affluent consumers of industrialized societies is that consumers who follow the vendors' recommendations may not consume sufficient maca to obtain its nutritional

benefits.

Thus, conventional wisdom regarding maca in industrialized societies provides 500 or 1,000 mg capsules of maca, or of powdered maca supplement, and promotes or suggests aphrodisiac qualities of maca. Such claims may, on the face of it, find some basis in the use of maca for centuries in South America to promote fertility in domesticated animals at high altitude, and in the indigenous peoples' beliefs that such benefits may be shared by humans. Furthermore, scientific studies have shown that maca increases both male and female fertility of sheep and can increase both litter size and number in guinea pigs. The difficulty is that both the folklore and the scientific studies are based upon the consumption of maca as a food and in quantities of at least 20 grams dry maca per day for at least 15 days. This data suggests that a daily intake of forty to fifty 500 mg capsules would be needed to provide an equivalent intake in capsular form, clearly an impractical quantity. Applicant is not aware of any teaching suggesting that consumption of such small quantities of maca as one gram per day, which is to say less than 0.2 grams protein equivalent, will provide any nutritional or medicinal benefit.

Accordingly, the invention provides maca-containing food products, suitable for commercial distribution, and methods of making such food products, which products and methods permit enable consumers, even consumers not culturally familiar with maca to obtain the nutritional benefits of maca in a convenient and palatable manner. Nutritional benefits generally accrue over a period of time so that nutritional beneficial foodstuffs should be palatable and attractive to encourage regular consumption. The maca food products of the invention facilitate the consumption or ingestion of beneficial quantities of maca on a daily or comparably regular basis for extended or indefinite periods of time, for example two, four or more weeks or more, or three or six months.

Proportions

The maca-containing food products of the invention comprise a broad range of largely cooked foodstuffs, especially foods which are cooked after adding maca, preferably in dried and powdered form. The maca can be additional to conventional ingredients, or it may wholly or partially replace one or more ingredients. In a number of preferred embodiments, such as pasta, breads, cookies, muffins and other baked goods, maca powder can partially or wholly replace grain flour that would be used in conventional recipes. The proportion of maca in such food products can vary quite widely, the lower limit being preferably sufficient to provide a significant benefit when the food product is consumed on a regular basis, or for a particular purpose, and the upper limit being such as to permit a dimensionally stable, palatable product to be formulated. Proportions herein are, unless otherwise stated, by weight, based upon a product's total ingredient weight prior to cooking.

Thus, it is preferred that the food product comprise significantly more than one percent by weight of the total food product ingredients, before cooking. For example the proportion of maca is preferably at least three percent, but more preferably at least five percent, and in most cases at least 10 percent by weight of the food product. While there is no particular upper limit to the proportion of maca that can be used, it is generally preferred that maca comprise a minor proportion of the foodstuff so as not to overwhelm the conventional character of the food product.

Preferably maca comprises less than 40 percent by weight of the food product, and in most cases not more than about 25 percent. A useful range of maca for many products, for example, pasta, breads, specialty breads and pizza, as well as for animal foods such as pet treats, is about 10-20 percent by weight. Other foods such as crunches may employ less than about 10 percent maca, while still further foods,

for example chips or granola, may employ higher proportions of maca in the range of about 25-35 percent by weight.

Preferably maca powder is used in combination with a grain flour, for example wheat flour, spelt flour, corn flour, rye flour or rice flour. However vegetables flours, for example potato or yam may also be combined with maca or with maca and one or more grain flours to serve as the flour ingredient of foods such as pastas, breads, pastry foods, and cakes. In such high-flour foods, maca preferably comprises from about 10 to about 70 percent by weight of the flour component of the food, more preferably from about 20 to about 40 percent by weight of the flour component. In foods which customarily employ a lesser proportion of flour, for example gnocchi (made from cooked potatoes rather than potato flour), candy crunches, granola and animal treats or feeds such as horse nuggets, maca may comprise a high proportion of the flour component, for example from 50 to about 100 percent of the flour component.

By eating such foods, knowing the proportion of maca, an individual may readily consume substantial amounts of maca in excess of 10 gm per day, for example 20, 30 or 40 or more grams per day of maca, referring to the weight of the dry powder. Also, it would not be difficult to consume higher quantities such as 50 to 100 gm per day, if desired. By selecting particular foods to their liking and gradually increasing the proportion of maca in the foods selected, or their daily intake, an individual may easily plan a program to acquire a taste for maca.

Drying Maca

Dry, powdered maca for use in the practice of the invention can be prepared by comminuting maca tubers, after washing thoroughly, e.g. triple washing, for example by slicing and blending, preferably after peeling, and then drying the comminuted tubers at a temperature in the range of about 105-200 °C, preferably

about 120-140 °C, more preferably about 130 °C, to a desired dryness, preferably to a constant weight. One standardized drying method is specified as AOAC 925.10 method (Association of Official Analytical Chemists, "AOAC", 1990). The dried product is then ground to a desired mesh, for example to provide a powder comparable with all purpose flour. Preferred for use in the examples set forth herein is a powdered product dried at about 130 °C to a constant weight. Such a product is expected to be marketed by Rainforest Phytoceuticals, Delmar, NY in a one pound container such as is described with reference to Figure 1.

Packaging

It is a feature of the invention to provide maca in a suitable commercial package to be convenient and attractive to consumers in industrialized nations such as the United States, Japan and European countries. Preferably the maca is packaged in a container suitable for commercial distribution in such countries, and will keep the maca in good condition for a satisfactory storage period, for example at least three months. Preferably, also the package should be difficult to tamper with, and should preserve the maca to be delivered to the consumer in good condition. Further desirable package features are that it be convenient to the consumer and include a useful dispensing structure or device. Still further, it is desirable that the packaging permit storage and reuse by the consumer, or other end user such as restaurant, bakery, commercial kitchen or the like. For consumers, packages of 8, 16 or 32 ounces (about 227, 453 or 906 gm, respectively) provide a suitable bulk supply, while larger packages of about 5 or 10 lb, (about 2265 or 4530 gm) can be supplied for commercial use in restaurants, kitchens and so on.

One embodiment of a package providing such desirable features is illustrated in the drawing Figure. A wide range of alternative packages and packaging features will be apparent to those skilled in the art. The maca container illustrated in Figure 1 comprises a cylindrical drum 10 having a screw-down lid 12, which for esthetic

purposes can have an outer profile flush with that of drum 10. Drum 10 is preferably sealed by a frangible paper, plastic, metal or composite membrane 14 and in closes a sack 16 containing a desired quantity of powdered maca 18. In addition, a scoop 20, which is preferably a measuring scoop of stated capacity is included in drum 10. Sack 16 made the of any suitable material for example polyethylene, polypropylene or polyester film, is preferably transparent and is preferably sealed, for example by a twist tie 22. Optionally, container 10 may include, secured to the container, or to, or on a container label, or within the container, instructions for use of maca, optionally including recipes such as those described herein, one or more redeemable coupons, and contact information for obtaining information regarding maca and its use, for example telephone number, email web or postal address, and the like. Alternatively, some or all of such materials can be printed on the outside of the container or on a label around the container.

COMPARATIVE EXAMPLE A

Maca paste

About 15 ml maca powder is thoroughly mixed with about 20 ml water to a smooth slurry or paste. A tablespoonful of the paste is fried in an oiled skillet at about 350 °F. After 2-3 minutes, the product is still wet, with little sign of thickening, and is beginning to stick to the skillet. After 1-2 more minutes the product has still not thickened, does not look cooked, but is sticking significantly and is removed before it burns. Even after cooling the product is still a moist, paste unable to hold its shape. Product aroma is pronounced, and the mixed product is quite unpalatable before and after cooking with a strong, bitter, persistent flavor. In this test, maca does not behave like wheat flour which can be mixed with water and cooked to a pleasant, eatable dimensionally stable pancake or crust.

The following examples illustrate the preparation of maca-containing food products pursuant to the invention. Most of the products are shaped and intended to be cooked. The quantities given are suitable for preparation in the home for a small number of people, and can be scaled up, proportionately, for commercial production, employing industrial food-processing equipment, if desired. The approximation that 1 oz equals about 30 gm (rather than 28.35 gm), or 30 ml, has been used, noting that quantities given are approximate and subject to adjustment for quality variations in natural ingredients and for individual taste. It is the relative

proportions that are significant.

For convenience, the weights of some dried herbs and seasonings have been expressed as 1gm/ml volume equivalents, notwithstanding that the actual weights of the teaspoon or tablespoon volumes will be somewhat less.

EXAMPLE 1

Maca Pasta (Basic)

240	gm	spelt flour	(1 ½ cups)
80	gm	maca powder	(½ cup)
200	mg	sea salt	
15	ml	olive oil	(1 tbsp)
180	ml	water	(2/3 cup)

The ingredients are mixed together in a bowl, adjusting the quantity of liquid ingredients added, for consistency, kneaded as necessary, rolled out into a sheet and cut into strips, for spaghetti, linguini or the like, into rectangles for ravioli, or other suitable shape for shells, for tagliatelle or other shaped pasta product, as is known in the past-making arts. The pasta is air dried, to a lesser degree for immediate consumption, or for freezing, or to a somewhat greater degree if the product is intended to be packaged and marketed dry. The dry product comprises well-defined pasta pieces with good structural integrity. The dried maca pasta is cooked in boiling water to a desired tenderness for from about 7 to about 15 minutes yielding a cooked shaped pasta product.. The individual pasta strands or pieces are coherent solids with a conventional pasta appearance. They are palatable with a good texture and interesting flavor.

EXAMPLE 2

The method of Example 1 is repeated substituting barley, buckwheat, kamut, masa, millet, oat, rye, semolina, teff, or wheat flour, or mixtures of the foregoing flours for spelt flour. The wheat flour may be durum, white, or wholewheat flour, or a mixture thereof. Comparable results are obtained.

The method of Example 1 is further repeated using the ingredients set forth in Examples 3-14 below. In each case, comparable or equivalent results are obtained.

EXAMPLE 3

Single-Herb Maca Pasta

160	gm	spelt	(1 cup)
40	gm	maca powder	(1/4 cup)
15	gm	fresh herb	(1 tbsp)
30	gm	lemon or lime juice	(2 tbsp)
60	ml	egg whites	(2 ea.)
15	gm	olive oil	(1 tbsp)
60	ml	water	(1/4 cup)

EXAMPLE 4

Herbal Maca Pasta

240	gm	spelt	(1 ½ cups)

80	gm	maca powder	(½ cup)
5	ml	sea salt	(1 tsp)
90	ml	egg whites	(3 ea.)
15	gm	olive oil	(1 tbsp)
60-120	ml	water	(1/4 - ½ cup)
60	ml	dried herbs (1 tbsp each: parsley, dill, tarragon, cilantro)	

EXAMPLE 5

Maca-Rice Pasta

80	gm	maca powder	(½ cup)
80	gm	white rice flour	(½ cup)
80	gm	brown rice flour	(½ cup)
500	mg	sea salt	
15	ml	olive oil	(1 tblsp.)
130	ml	water	(½ cup)

EXAMPLE 6

Sweet Maca Pasta

120	gm	spelt	(3/4 cup)
80	gm	maca powder	(½ cup)
120	gm	white sweet potato flour	(3/4 cup)
15	gm	powdered gluten	
200	mg	sea salt	
15	ml	olive oi	(1 tblsp.)
180	ml	water	(2/3 cup)

EXAMPLE 7

Yam flour or malanga flour is substituted for the white sweet potato flour used in Example 6.

EXAMPLE 8

Maca Bean Pasta

120	gm	kamut	(3/4/cup)
80	gm	maca powder	(½ cup)
120	gm	black bean flour	(3/4 cup)
15	gm	powdered gluten	
15	gm	chili powder	(1 tbsp)
30	gm	onion powder	(2 tbsp)
45	gm	dried basil	(3 tbsp)
200	mg	sea salt	
15	ml	olive oil	
180	ml	water	(2/3 cup)

EXAMPLE 9

Oriental Maca-Rice Pasta

118	gm	maca powder	(3/4 cup)
109	gm	white rice flour	(less than 3/4 cup)

109	gm	brown rice flour	(less than 3/4 cup)
91	gm	potato flour	(less than 3/4 cup)
20	gm	powdered ginger	
20	gm	powdered wasabi	
15	gm	powdered egg white	(equal to 1 egg)
15	ml	olive oil	
220	ml	water	(1 cup)

EXAMPLE 10

A similar quantity of the mixed ingredients of the Maca Pasta (Basic) recipe of Example 1 is substituted for the maca powder in Example 9.

EXAMPLE 11

One or more of artichoke, casava, garbanzo, lotus, malanga, masa, sweet rice, quinoa, soy, sweet potato, water chestnut, or yam flours is substituted for one or more of the white rice or brown rice flours or the potato flour in Example 9.

EXAMPLE 12

Maca-Kamut Pasta

160	gm	kamut	(1 cup)
55	gm	maca powder	(1/3 cup)
10	ml	dry oregano	(2 tsp)
45	ml	lemon juice	(3 tbsp)
15	ml	olive oil	(1 tbsp)
60	ml	water	(1/4 cup)

EXAMPLE 13

Tex-Mex Maca Pasta

240	gm	spelt	(1 ½ cups)
80	gm	maca powder	(½ cup)
30	ml	cilantro, fresh, chopped	(2 tbsp)
2	ml	chili powder	(½ tsp)
2	ml	onion powder	(½ tsp)
60	ml	egg whites	(2 ea.)
15	ml	olive oil	(1 tbsp)
60	ml	water	(1/4 cup)

EXAMPLE 14

Maca-Quinoa Pasta

55	gm	quinoa flour	(1/3 cup)
55	gm	maca powder	(1/3 cup)
55	gm	potato flour	(1/3 cup)
55	gm	tapioca flour	(1/3 cup)
60	ml	egg whites	(2 ea.)
15	ml	olive oil	(1 tbsp)
60	ml	water (1/4 cup)	

EXAMPLE 15

Basic Maca Bagel

Step 1: Yeast Mix	240	ml	warm water	(1 cup)
	1	pkg	active dry yeast	
	7	gm	sugar	(1 ½ tsp)
	7	gm	sea salt	(1 ½ tsp)
Step 2: Flour	320	gm	all purpose flour	(2 cups)
	80	gm	maca powder	(½ cup)
Step 3: Water Boil	3000	ml	water	(3 qt)
	7	gm	sugar	(1 tbsp)
Step 2: Batter Mix	80	gm	cornmeal batter	(½ cup)
	30	gm	egg yolk	(1 ea)
	15	ml	water	(1 tbsp)

Step 1, mix warm water, yeast and sugar, let stand 5 minutes, stir in salt. Step 2, add and mix 2 cups flour, beat (med) 5 minutes, add ½ cup maca, mix. Knead 15 minutes. Remove to oiled bowl, cover, let stand 30 minutes. Knead and divide into six pieces. Knead each piece into a ball, poke thumbs through center, shape. Place on floured board, cover, let stand at room temperature for 20 minutes. Step 3, bring 3 quarts water plus sugar to a boil, heat oven to 400°F, and grease baking sheet. Drop bagels in water (ea), boil 5 minutes with turning. Remove, drain, brush with batter made in step 4, bake 30 - 45 minutes. Bagels of traditional appearance with good texture and structural integrity as well as an agreeable flavor are produced.

EXAMPLE 16

Maca Wheat Bagels

Example 15 is repeated, substituting 1 ½ tbsp honey for sugar and substituting 1 cup whole wheat flour and 1/4 cup wheat germ for 1 1/4 cups all purpose flour. Comparable or equivalent results are obtained.

EXAMPLE 17

Maca Pumpernickel Bagels

Example 15 is repeated, substituting 1½ tbsp dark molasses for sugar and substitute 1 cup rye flour, ½ cup whole what flour, for 1½ cup of all purpose flour. Comparable or equivalent results are obtained.

EXAMPLE 18

Maca Onion Bagels

Example 15 is repeated, adding ½ cup toasted onion flakes to basic dough with the yeast, water and sugar. Comparable or equivalent results are obtained.

EXAMPLE 19

Maca Rye Loaf

240	gm	rye flour	(1½ cup)
80	gm	maca powder	(½ cup)

15	gm	dry yeast	(1 tbsp)
80	ml	warm water	(½ cup)
5	gm	salt	(2 tsp)
30	ml	canola oil	(2 tbsp)
30	ml	cider vinegar	(2 tbsp)
80	gm	unbleached white flour	(½ cup)

Rye and maca powders are added to a bowl. The yeast is dissolved in water added to the bowl and mixed with the flours. Salt, oil, and vinegar are added, stirring well. White flour is added and the dough is kneaded well and formed into any desired loaf or loaves. The loaves are brushed on the surface with oil , set in a pan and allowed to double in size, then baked in a preheated oven at 350°F for 1-1/4 hours. Well-shaped bread loaves of good texture and structural integrity as well as an appealing flavor are obtained.

EXAMPLE 20

Maca Pita

Starter:	120	ml	water	(4 oz)
	45	gm	yeast	(1 ½ oz)
Pita:	240	ml	water	(8 oz)
	15	gm	salt	(½ oz)
	15	ml	olive oil	(1 tbsp)
	90	gm	whole wheat flour	(3 oz)
	240	gm	maca powder	(8 oz)
	480	gm	high gluten flour	(16 oz)

Mix starter and let stand 5 minutes. Mix remaining ingredients, add starter, knead 10 minutes, let stand 30 minutes covered. Make 5 ounce balls, let rest 5 minutes, roll out to circles, about 1/4 inch thick. Let rest 20 minutes and bake on a stone at 500°F for 3 minutes. Well-shaped pitas of good texture and structural integrity as well as an appealing flavor are obtained.

EXAMPLE 21

Maca Gnocchi

360	gm	boiling potatoes	(3/4 lb)
80	gm	all purpose flour	(½ cup)
80	gm	maca powder	(½ cup)
105	gm	fresh grated parmesan cheese	(2/3 cup)
		Sauce: tomato, pesto, etc. as desired.	

Boil unpeeled potatoes until tender, drain, peel when able. Puree while warm. Add maca powder and most of flour. Beat until smooth. Add remaining flour, incorporate, knead five minutes into dough. Shape into tablespoon-size balls, crease center, boil in salted water until gnocchi rise (8 - 10 minutes) and drain. Well-shaped gnocchi of good texture and structural integrity as well as an appealing flavor are obtained. They can be served with sauce and cheese.

EXAMPLE 22

Example 21 is repeated substituting arrowroot flour for the all purpose flour. Similar results are obtained.

EXAMPLE 23

Maca Pizza

280	gm	bread flour	(1 3/4 cup)
80	gm	maca powder	(½ cup)
5	gm	salt	(1 tsp)
7	ml	vegetable oil	(1 ½ tsp)
120	ml	water	(3/4 cup)
5	gm	dry yeast	(1 tsp)

Sauce: tomato, pesto, etc. as desired.

Place flour, maca and salt in bread pan, add water and mix. Add yeast and knead. Let stand 30 minutes covered. Divide equally into four balls, place on floured surface, cover with plastic wrap, let stand 20 minutes. Roll each into a flat circle, place on greased baking pan, prick with fork, brush with sauce of choice, add toppings, bake 15 - 20 minutes at 500°F. Well-shaped pizza of good texture and structural integrity as well as an appealing flavor is obtained.

EXAMPLE 24

Maca Tortillas

240	gm	all purpose flour	(1 ½ cups)
80	gm	maca powder	(½ cup)
40	gm	vegetable shortening, pieced	(1/4 cup)
2	gm	baking powder	(½ tsp)
2	gm	salt	(½ tsp)
120	ml	warm water	(3/4 cup)

In a bowl, mix flour, maca, baking powder, shortening, and salt, until a meal is obtained. Add water dropwise, incorporate, form dough and knead until elastic. Divide into ten equal portions, ball, cover and let stand 30 minutes. Roll each into a 6" disk, cook on a pre-heated surface until both sides are golden. Well-shaped tortillas of good texture and structural integrity as well as an appealing flavor are obtained.

EXAMPLE 25

Maca Nut Crunch

360	gm	granulated sugar	(2 1/4 cups)
80	gm	maca powder	(½ cup)
60	gm	unsalted butter	(½ stick)
160	ml	water	(2/3 cup)
5	gm	salt	(1 tsp)
240	gm	crushed macadamia nuts	(1 ½ cups)

In a heavy saucepan, add sugar, maca, butter, water. Cook over medium heat with stirring to a golden-brown syrup (approximately 25 minutes). Remove from stove. Stir in macadamia nuts. Pour into 9" x 13" greased foil-lined pan. Let set and cool. Break into

bite-sized pieces. The nut crunch pieces are firm and solid, have good texture and an appealing flavor.

EXAMPLE 26

Spicy Maca Chips

160	gm	maca powder	(1 cup)
160	gm	all purpose flour	(1 cup)
40	ml	vegetable shortening, pieced	(1/4 cup)
2	mg	baking powder	(½ tsp)
2	mg	salt	(½ tsp)
30	ml	crab boil spices	(2 tbsp)
2	mg	garlic powder	(½ tsp)
2	mg	chili powder	(½ tsp)
120	ml	warm water	(½ cup)

In a bowl, mix flour, maca, baking powder, shortening, salt, garlic and chili powder until a meal is obtained. Mix together crab boil and water. Add dropwise, incorporate, form dough, knead until elastic. Divide into workable portions, ball, cover, let stand 30 minutes. Roll each into a thin sheet. Cut into desired shapes, place single layered on non-stick (or greased) cookie sheet and bake in a pre-heated oven at 400°F for about 10 minutes until crisp or fry in vegetable oil at about 375°F, 3 - 5 minutes. Well-shaped chips of good texture and structural integrity as well as an appealing flavor are obtained.

EXAMPLE 27

Maca Croutons

640-960	gm	cubed maca rye bread (Ex. 19)	(4-6 cups)
30	gm	butter	(2 tbsp)
30	ml	olive oil	(2 tbsp)
5	gm	oregano	(1 tsp)
5	gm	fines herbs	(1 tsp)
2		cloves garlic, crushed	
		Salt and pepper to taste	

Melt butter in a large pan (11" x 14") in a preheated oven at about 200°F. Add oil. Press garlic into oil and butter mixture. Add herbs, mix well. Add salt and pepper to taste. Add bread cubes and tumble until well coated. Spread in single layer. Dry in oven 15 - 30 minutes. The croutons have good texture and structural integrity as well as an appealing flavor.

Sub A'2

EXAMPLE 28

Mac Dog Treats

80	gm	cornmeal	(½ cup)
160	gm	whole wheat flour	(1 cup)
120	gm	maca powder	(3/4 cup)
30	gm	garlic powder	(2 tbsp)
30	ml	instant stock mix (beef, chicken and vegetable)	(2 tbsp)

30	gm	bacon bits	(2 tbsp)
90	ml	oil	(6 tbsp)
105	gm	water	(2/3 cup)
		Powdered multivitamins (optional)	

Add all dry ingredients together, mis. Add in wet ingredients and mix well to cornmeal consistency. Roll out 1/4" sheet and cut with biscuit cutter. Place on cookie sheet and bake at about 350°F for about 35-45 minutes, basting with meat drippings or bacon fat. Allow to cool before serving. Well-shaped dog biscuits, or treats, of good texture and structural integrity are obtained which are appealing to dogs.

Sub A3

EXAMPLE 29

Mac Cat Cookies

240	gm	can tuna (in oil)	(8 oz)
215	gm	flour	(1 1/3 cups)
215	gm	cornmeal	(1 1/3 cups)
215	gm	flour	(1 1/3 cups)
215	gm	maca powder	(1 1/3 cups)
120	gm	water	(3/4 cup)
105	ml	vegetable oil	(2/3 cup)
2	gm	salt	(½ tsp)
		Multivitamins (optional)	

Mix all ingredients. Knead to combine. Roll to 1/4" thick sheet. Cut to desired shape. Bake on greased cookie sheet 350°F, 25 - 30 minutes. Cool. Store refrigerated. Well-shaped cat cookies, or treats, of good texture and structural integrity are obtained which are appealing to cats.

Sub A4

EXAMPLE 30

Mac Horse Nuggets

320	gm	rolled oats	(2 cups)
320	gm	sweet feed	(2 cups)
320	gm	maca powder	(2 cups)
800	ml	bran	(5 cups)
240	gm	molasses	(1 1/2 cups)

Mix grains and maca together in large bowl. Add molasses, knead until well mixed. Place 1/3 cup portions on greased cookie sheet and bake at about 375°F for about 10 - 12 minutes. Cool. Store refrigerated or frozen. Well-shaped horse nuggets, or treats, of good texture and structural integrity are obtained which are appealing to horses.

EXAMPLE 31

Maca Granola

320	gm	rolled oats	(2 cups)
320	gm	granola	(2 cups)
80	gm	wheat germ	(½ cup)
80	gm	sesame seeds	(½ cup)

40	gm	shelled pecans (or other nuts)	(1/4 cup)
40	gm	raisins	(1/4 cup)
40	gm	dried fruit	(1/4 cup)
20	gm	grated coconut	(1/8 cup)
30	ml	light sesame oil	(2 tbsp)
40	ml	honey	(1/4 cup)
5	gm	ground cardamon	(1 tsp)
2	gm	grated nutmeg	(½ tsp)

Toast oats, wheat germ, maca, seeds, legumes lightly on a baking sheet until browned (350°F, 5 - 10 minutes). Cool. Heat honey, oil in a small pan and trickle over dry mix. Sprinkle with cardamom. Return to oven and heat an additional 5 minutes. Stir and turn. Heat a further 5 minutes until brown (not crispy). Remove, cool, add raisins, fruit, nuts, mix well. The cooked product is palatable and has a good flavor. The maca is well integrated and not apparent as a separate ingredient.

EXAMPLE 32

Maca Wafers

80	gm	butter	(½ cup)
240	gm	graham flour	(2 cups)
80	gm	maca powder	(½ cup)
15	gm	baking powder	(1 tbsp)
30	gm	brown sugar	(2 tbsp)
7	gm	cinnamon, ground	(½ tbsp)
40	ml	honey	(1/4 cup)
60	ml	beaten egg	(1 whole)
40	ml	hot water	(1/4 cup)

Preheat oven (350°F). Cut and mix butter into flour and maca to a cornmeal texture. Stir in baking powder, brown sugar, cinnamon. Add egg, hot water, mix well. Knead as dough 2 - 3 minutes. Set one-half aside. Roll out into a square 1/8" thick. Place on ungreased baking sheet. With sharp knife, score into 2" squares. Bake 10 minutes until lightly brown. Repeat with remaining one-half dough. Cool, separate. Well-shaped wafers of good texture and structural integrity as well as an appealing flavor are obtained.

COMPARATIVE EXAMPLE B

Wheat flour dough

One part of high gluten bread (wheat) flour is mixed with sufficient egg white to form a good dough. The dough is compared with a similar dough prepared using water in place of the egg white and is examined for elasticity by manually stretching the dough. There is little difference in elasticity between the water-only dough and the egg white dough.

EXAMPLE 33

Maca dough

Comparative Example B is repeated using a mixture of one part maca powder and one part red flower in place of the breadth are of comparative example B. Surprisingly, the egg white dough exhibits significantly more elasticity that the water-based dough. Such elasticity is desirable in structurally integrating the maca into the end-product foodstuff.

Also, good elasticity is associated with a lighter bread. It may be theorized, although the invention is not bound by such theory, that the maca proteins, which are a prominent component of maca, permit cross-linking with egg white albumen to provide the kind of molecular structure commonly associated with elasticity.

The food products of the foregoing Examples 1-33 (not including Comparative Examples A and B) have enhanced nutritional value derived from the presence of maca as compared with the equivalent products lacking maca.

The dry ingredients of the foregoing recipes, or some of the dry ingredients, for example maca powder mixed with flour, can, pursuant to the invention, be commercially supplied as a package of ingredients for use in one or more of the recipes.

The quantities of maca powder employed in the foregoing examples, and their proportions with respect to the total flour and total ingredients used in the examples, are set forth in the Table.

TABLE

Maca as a percentage constituent of total flour and of total ingredients in the examples.

Example	*Maca gm*	*Flour gm*	*Total gm*	*Maca % flour*	*Maca % Total*
Ex. 1 pasta	80	320	515	25.00	15.53
Ex. 3 pasta	40	200	370	20.00	10.81
Ex. 4 pasta (60 ml water)	80	320	550	25.00	14.55
Ex. 4 pasta (120 ml water)	80	320	610	25.00	13.11
Ex. 5 pasta	80	240	385	33.33	20.78
Ex. 6-8 pasta	80	335	530	23.88	15.09
Ex. 9 pasta	118	427	717	27.63	16.46
Ex. 12 pasta	55	270	400	20.37	13.75
Ex. 13 pasta	80	320	489	25.00	16.36
Ex. 14 pasta	55	220	355	25.00	15.49
Ex. 15 bagels	80	400	654	20.00	12.23
Ex. 19 bread	80	320	560	25.00	14.29
Ex. 20 pita	240	810	1245	29.63	19.28
Ex. 21 gnocchi	80	80	500	100.00	16.00
Ex. 23 pizza	80	360	497	22.22	16.10
Ex. 24 tortilla	80	320	484	25.00	16.53
Ex. 25 crunch	80	80	905	100.00	8.84
Ex. 26 chips	160	320	518	50.00	30.89
Ex. 28 dog treats	120	360	645	33.33	18.60
Ex. 29 cat cookies	215	860	1327	25.00	16.20
Ex. 30 horse nuggets	320	320	2000	100.00	16.00
Ex. 31 granola	320	320	1017	100.00	31.47
Ex. 32 wafers	80	335	592	23.88	13.51

While the invention has been described with particular reference to a variety of cooked and shaped food products for either human or animal consumption, and to the commercial marketing of bulk supplies of powdered maca for preparing such food products, it will be understood that the invention includes a wide range of

food products other than those specifically mentioned herein, including cookies and crackers, as well as macaroni, noodles, lasagne and other pasta product, cakes and muffins, pastry products and the like for human consumption. In addition, the invention includes shaped or cooked, or shaped and cooked maca-containing feedstuffs for agricultural, piscicultural, veterinary or zoological use for health maintenance or therapeutic purposes including, in particular, treatment of sterility in breeding animals.

Some animals which may benefit from a maca-containing feed as an alternative to, or supplement to, a relatively low nutritional value feed, are common farm animals such as cows, sheep, horses, llamas, goats, and pigs, as well as exotics such as mink and ostriches. Zoo animals, for example monkeys and apes may also benefit as may carnivores such as wild cats, dolphins, sharks and whales when meats, fish, prey or other high proteins are unavailable.

Furthermore, while the invention has been described with reference to maca, as this is a cultivated and widely available species in certain parts of South America, those skilled in the art will understand that the invention may also be able to employ other species of cruciform, or other plant family, that are known or become known, including species closely related to maca and species not closely related to maca; and to genetically engineered variants or other genetically induced variants of maca; which display a similar combination of useful properties, especially, but without limitation, the development of large fleshy roots, corms or fruits that are readily stored and have advantageous nutritional characteristics, for example nutritional profiles that compare favorably with cereals. The ability to be cultivated in agriculturally poor regions and an established consuming culture are further desirable characteristics of such species alternatives to maca.

While illustrative embodiments of the invention have been described above, it is, of

course, understood that various modifications will be apparent to those of ordinary skill in the art. Many such modifications are contemplated as being within the spirit and scope of the invention.

The following references relating to maca are hereby incorporated herein by reference thereto:

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